examples in the last paragraph reveal, not all entities at a given level will be of the same order of magnitude. The level at which a particular entity resides depends on the role it is playing in the mechanism. A heart is a critical part of the circulatory system of a surgeon, which in turn plays a critical role in the ability of the surgeon to perform surgery. But when the surgeon is performing heart surgery, she is interacting with the patient's heart – holding it, reconnecting it, etc. In that interaction the patient's heart is at the same level as the surgeon performing the operation, whereas the surgeon's own heart is at a lower level. Likewise, in oxidative phosphorylation, there are protons in the atoms that comprise the lipid molecules of the inner mitochondrial membrane as well as protons being pumped across the membrane. The protons pumped across the membrane interact with it (as illustrated later in Figure 6.9), but protons in the lipid molecules are at a lower level than the protons being pumped.

So far I have emphasized that in a mechanistic account of levels it is the components of a mechanism that are the denizens of a lower level. In contrast, it is the mechanism as a whole and the things with which it interacts that inhabit the higher level. These interactions with other things may greatly influence the behavior of the mechanism and many of these things may themselves be fruitfully construed as mechanisms. In some cases a mechanism may be part of an organized system in which its behavior is coordinated with that of other entities to perform yet another function. In that case, the first mechanism is a component of the yet higher-level mechanism. If the organization in the higher-level mechanism results in the imposition of constraints on the behavior of the first mechanism, such embedding of a mechanism into a higher-level mechanism can be highly relevant for the scientist trying to explain the operation of the initial mechanism. Moreover, just as one can go up from a given mechanism to a higher-level mechanism, one can proceed down from a component of a mechanism to yet lower-level components. A mechanistic account thus gives rise to a cascade of levels.

Given the differences in the way levels are characterized, it is not surprising that the mechanistic account of reduction looks very different from traditional philosophical accounts of reduction which hold that higher-level theories are reduced by logically deriving them from lower-level theories (Nagel, 1961; Causey, 1977). For such a derivation to succeed, all the information required to generate the higher-level must be contained in the lower-level theory. If this is the case, a successful theory reduction renders the derived theory superfluous – everything is explained equally well with the lower-level theory. With mechanistic explanations, accounts of the lower level do not offer a complete theory. None of the components, alone, generates the phenomenon.